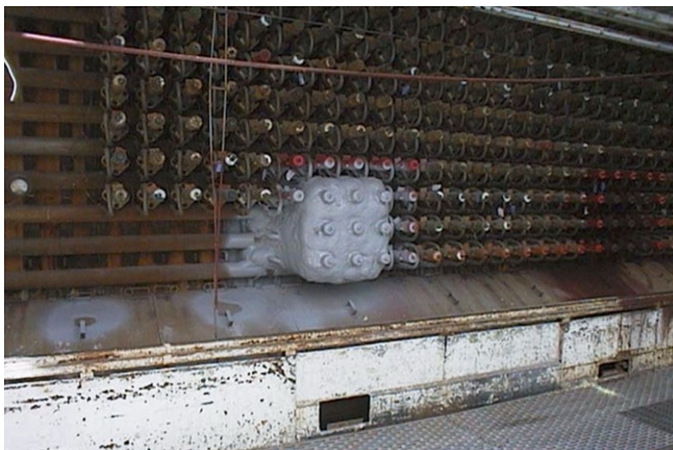




Technology Demonstration Fact Sheet

Reactor Stabilization



SUMMARY

The Hanford Site C Reactor Technology Demonstration Group demonstrated fixative coatings for reactor stabilization in two phases. Phase I consisted of a series of laboratory assessments performed by Wyle Laboratories (Huntsville, AL) on various stabilization coatings (four innovative, one conventional (baseline)). Phase 2 consisted of applying the baseline coating and two of the acceptable coatings (those that passed Wyle Lab's assessments) at the reactor front face. For decontamination and decommissioning (D&D) projects such as C Reactor at the Hanford Site, interim safe storage (ISS) of the reactor block is being implemented, and reactor stabilization technology can be used for fixation of radiologically contaminated surfaces that would be left behind during the ISS period. The baseline coating is Rust-Oleum No. 769. Performance of the improved coatings versus the baseline coating was as follows:

- Better contamination fixation, with fast curing at ambient temperatures.
- A dual coating system consisting of polymeric film over a foam base provided complete coverage.
- Neither film-only coating, an innovative polymer nor Rust-Oleum, provided complete coverage.
- Improved ALARA practice resulting from better fixation.
- Application of the improved coatings is more time consuming and labor intensive.
- Application of the improved technologies is simple but needs more specialized and trained personnel.

IMPROVED TECHNOLOGY DESCRIPTION

Coatings offered by RedHawk Environmental and Master-Lee were among those that passed laboratory assessments, and these two firms were able to schedule field demonstrations.

RedHawk: The RedHawk coating consists of two layers, 1) a polyurethane foam base layer, which is covered by 2) a polyurea film cover (finish). The RedHawk coating applicator consists of a Gusmer Model H-3500 high-pressure proportioner that controls the mixture of two compounds and a Gusmer Model No. GX-7 spray gun. The same units are used for mixing, spraying poly-urethane foam and polyurea film. The foam chemical formulation is somewhat different than the film.

Master-Lee: The Master-Lee coating consists of a polyurea film only. The coating applicator consists of a modified Gusmer Model H-2000 high-pressure proportioner that controls the mixture of two compounds and a Gusmer Model No. GX-7 spray gun. In both cases coatings (film or foam) are prepared by mixing two different compounds in proper proportions at the spray gun. The compounds are delivered from the proportioner to the spray gun via a pair of hoses. An array of 9 nozzle assemblies on 8 ft 2 of the reactor front face was coated by each vendor separately.

BASELINE TECHNOLOGY DESCRIPTION

The baseline demonstration was done with Rust-Oleum No. 769 dampproof primer. For application of this paint on the surfaces, a conventional airless paint spray pump and gun were used. The paint was mixed at the pump and delivered to the paint spray gun via a hose.

DEMONSTRATION DESCRIPTION

Prior to application at the Hanford Site C Reactor, the baseline and 4 innovative coatings were applied to small metal coupons (3" x 3") for a series of laboratory assessments. Results are presented in the Table 1 along with permeability comparisons done on film samples. One coating, a silicon/organic complex, passed the lab assessments, but the vendor was unable to schedule the field demonstration. Another coating, a phenolic formulation, failed the initial adhesion check and was not assessed further.

Table 1. Laboratory Assessments

Type of Assessment	Improved		Baseline
	Master-Lee Film	RedHawk Foam + Film	Rust-Oleum No. 769
Wyle Laboratories Assessments			
Check adhesion	P	Foam F Film P	F*
Thermal & rad. aging	P	P	P
Check adhesion	P	Foam F Film P	P
Chill; humidity; biodegradation	P	P	P
Thermal cycling	P	P	
Check adhesion	P	Foam F Film P	P
Effect of Thermal and Rad Aging on Permeability (Measurements by Independent Laboratories)			
Air Permeability	Increased by 10%	Decreased **	NA
Moisture Permeability	Increased by 10%	Increased by 20%	NA

Notes: P = Pass, F = Fail, NA - Not assessed

*The baseline coating did not cure until heated in lab thermal aging oven.

**Permeability decreased by aging.

Table 2 compares the improved and baseline performance. It should be noted that the innovative coating formulations include di-isocyanates that require use of an air-supplied respirator, whereas an air-purifying respirator is adequate when spraying the baseline coating.

DETAILS OF BENEFITS

- The innovative polyurea film sets up almost immediately and adheres.
- When the foam is used as an undercoat, it completely covers enough of the complex shapes so that the film overcoat can easily be applied with 100% coverage.
- The film forms a low-permeability layer over the foam and can adhere the coating system to the reactor face.
- Inspection of the foam + film system for quality control is simple.

SUCCESS CRITERIA

- Coverage of complex shapes and good adherence
- Improved long-term ALARA versus baseline by achieving fixation with foam + film

- Ability of coating to adhere and to set up in a short time, withstand aging and thermal cycling up to 75 years and maintain integrity when subjected to chilling, humidity and potential biodegradation
- Simple to deploy, requiring some skill levels

Table 2. Performance (for 8 ft 2 of face with 9 nozzles)

Type of Assessment	Improved		Baseline
	Master-Lee Film	RedHawk Foam + Film	Rust-Oleum No. 769
Setup	40 min	64 min	30 min
Priming	25 min	1 min	1 min
Spray foam	None	20 min	None
Spray film	11 min	7 min	4 min
Demob.	45 min	60 min	30 min
Crew	2	3	2
Coverage	Incomplete	Complete	Incomplete
Approx. film thickness	90 mil	70 mil	2 mil
Inspection time	Extensive	Short	Extensive

SCHEDULE

The demonstration was conducted from August 1997 to March 1998 for laboratory assessments, and March 19 and 24, 1998 for the field demonstration.

FUTURE APPLICABILITY

For D&D projects such as C Reactor at the Hanford Site. Interim safe storage (ISS) can use Reactor Stabilization technology for fixation of radiologically contaminated surfaces. The technology can be applied at private and government (DOE, EPA, DOD, etc.) sites.

CONTACT PERSONS

John Duda, FETC, (304) 285-4217
 Shannon Saget, DOE-RL, (509) 372-4029
 Jeff Bruggeman, DOE-RL, (509) 376-7121
 Stephen Pulsford, BHI, (509) 375-4640
 Jim Anderson, Wyle Laboratories, (256) 837-4411
 Don Kooser, Master-Lee, (509) 783-3523
 Marc Azure, RedHawk Environmental, (509) 947-4222